Studies of the interfaces between the catenary and the euro/1950 pantographs (2013)

Project description:

As the dynamic behaviour of trains partly involves swaying, which is mainly caused by the roughness and irregularities of the track, the lack of camber and the wind load. The sway of the pantographs on the trains must be limited to avoid intrusions into the mechanical and electrical gauges of the infrastructure and to prevent the pantograph contact wire from coming off in windy conditions.

The design of the catenary therefore depends on constraints such as wind load, track layout, rolling stock and pantographs and so results in a specific design of the catenary for a line or a network (span length, contact wire height, etc.).

The methods of calculating the effects of the constraints are mainly described in the European standards (TSI, EN), supplemented by country-specific sets of rules (e.g. IN). The TSIs define the basic parameters, such as the

maximum lateral deviation of the catenary, but many different assumptions and rules are used to calculate this parameter. Therefore, the maximum lengths of the spans authorised are different in the various EU Member States, even when the catenaries are installed in similar cases.

TUC RAIL was selected by the European Railway Agency (ERA) to study the interface between Euro/1950 pantographs and the catenary design used in the following six EU countries: France, Belgium, Spain, Germany, Italy and Poland.

The aim of the study was to provide the ERA (European Railway Agency) with a clear technical and economic analysis of the parameters for designing and adapting catenary systems across the EU rail network to make them suitable for both 1950 mm and 1600 mm pantographs.

TUC RAIL's mission

TUC RAIL was in charge of studying the interface between pantographs and catenary to find the optimal conditions that have an impact on traction, studying the current catenary design taking into account the infrastructure constraints (e.g. electrical gauge) and studying the probability of coincidence on degraded modes (statistics and risk analysis).

For this study, the TSIs (Technical Specifications for Interoperability) and the national design rules, were analysed for each of the six selected countries. Through interviews with the relevant railway infrastructure managers, additional information was gathered on the operational processes applied for the catenary design. A few sections of existing lines on the respective networks were analysed for each country to verify and understand how the standards and technical specifications of each catenary are implemented in a real project. The study took into account both conventional and high-speed lines, as well as both electrification systems (DC and AC).

The study results, published in an ERA report, showed possible parameters for adapting the catenary design to accommodate both 1600 mm and 1950 mm pantographs throughout the European network, while ensuring safe and efficient operations.

By carrying out this expert mission for ERA, TUC RAIL was able to highlight its technical competence in several European countries.